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COVER: From guns to jeeps the Army is getting into the air. An H-34 is shown transporting a jeep by means of an external sling.

This copy is not for sale. It is intended for more than one reader.

PLEASE READ IT AND PASS IT ALONG

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THE COMMANDANT'S COLUMN

Brigadier General Carl I. Hutton, *USA*
Commanding General, The Army Aviation Center

The views expressed in this article are the author's and are not necessarily those of the Department of the Army.—The Editor

Joint Strategy

JOINT STRATEGY requires forces which are organized, equipped and trained to work together. The practical problem is how to gain unified action from air forces which operate at tremendous speeds, land forces which have extremely limited mobility, and naval forces whose mobility potential lies between those of the Air Force and the Army. These are widely divergent capabilities, and under the most favorable conditions joint action is difficult to coordinate. Without proper equipment and training, it is likely that joint action will be impossible.

It would appear that an important role of the Army in joint strategy is to exploit the neutralizing effects of fire power—whether the fire power is delivered by missiles, bombers, satellites, or naval task forces. This is simply an extension of the traditional combination of fire and movement. Mobility has always been the Army's forte. At one time, only enough mobility was required to exploit artillery fire delivered immediately ahead of the troops. This will hardly be sufficient when the neutralizing fire can be delivered at very great ranges. Speed becomes essential in order to reach greater distances and to minimize the period of exposure to defensive fires. Greatly increased mobility is the apparent key to the Army's problem of assuming its appropriate role in joint strategy.

The need for speed and the effects of mobility are not new things in war. The immobile phalanx was overcome by the more

mobile legion; the legion by the Hun cavalry; the seventy pace per minute infantry of the 18th Century by Napoleon's 120 pace infantry; France's infantry divisions by Hitler's armored formations. The new element in our present situation seems to be that we have reached the point of diminishing returns in the application of the internal combustion engine to surface transportation. There is no practicable way to make vehicles move much faster across the surface of the terrain. The limitation is not power or design but the terrain itself.

On the other hand, the technology of air mobility is just beginning. Especially, the VTOL-STOL-helicopter-convertiplane technology is unexplored. This is an area which has more logical connection with the ground element of joint strategy than with the other elements. The Army will continue to merge with the terrain in fighting the ground battle. That, however, does not mean that the soldier must move on foot on the ground.

If joint strategy requires that the Army have a much greater mobile capability, this technological field would seem to offer the most likely possibilities. It is a field which does not overlap air power theories or functions. On the contrary, it offers an opportunity for the Army to adapt its tactics for joint action with the sister services in pursuance of joint strategy.

HELICOPTER PILOT INSTRUCTORS NEEDED

Civilian helicopter pilot instructors are needed at The Army Aviation Center. For information, write Chief, Civilian Personnel Division, The Army Aviation Center, Fort Rucker, Alabama

SELECTION AND ORGANIZATION OF ARMY AIRSTRIPS

Lieutenant Colonel Harry T. Shiveley, *Artillery*

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

DURING EXERCISE SAGE BRUSH the Combat Aviation Company, 3rd Infantry Division flew 3,562 hours including continuous twenty-four hour operations during certain periods in support of elements of the Division, requiring a total of forty-seven operational airstrips and hundreds of "chopper pads" in Louisiana.

Forty-seven strips during a period of approximately three weeks may seem numerous for one division but it must be remembered that the new Aviation Company was testing a new concept of operations. Thirty-nine aircraft including L-19s, L-20s, H-13s, and H-19s are organic to the Division and in this atomic age dispersion of installations and aircraft onto sub-fields is mandatory.

The Company habitually operated from a minimum of six different sites, one per Infantry Combat Command, Division Artillery, Support Command, and Division Headquarters. Each of the strips was selected, organized, and occupied by Flight Groups or the Company, thus assuring a maximum of experience of Army Aviators at all echelons.

Selections

Let's follow the process of selecting a Flight Group airfield in Louisiana. After determining the zone of action and mission of the supported unit, the friendly and enemy situation and capabilities, the proposed location of the supported unit CP, all vital factors to be considered, the initial reconnaissance for an airstrip was conducted on the extremely accurate 1/50,000 tactical map of the maneuver area.

The search for a likely airstrip began primarily for areas which furnished the best communications between the Flight Group, its

supported unit and the Aviation Company. The ideal situation would have been to have each of the three stations sitting on a plateau with no intervening hill masses blocking line of sight communications. However, our basic Field Manual 20-100 states that, when possible, the airfields should be defiladed. Out of necessity, because of large distances and low swampy areas combined with the limited range of FM radios, it was frequently necessary to forsake defiladed airstrips for less favorable ground which offered improved radio communications at a higher elevation. Because of this most of the airstrips were located on ridges which incidentally resulted in better drainage during the rainy season.

Choice of a strip, when terrain was available, was made so that when seen from the air, it did not immediately appear as an ideal location. The selection of a runway across an apparently rough field, running at a diagonal to the direction of the field, greatly assisted in camouflaging an entire airstrip.

Also, by map, the important question of security of the Flight Group was considered. An attempt was made to locate the airstrip near a reserve infantry or artillery battalion and from one to three miles from the supported unit's forward or rear CP within access to a navigable road to facilitate wire laying to the strip, liaison with the unit and feeding of personnel.

Ground Reconnaissance

Upon selection of an area the Flight Group Commander conducted the ground reconnaissance, coordinated with his aircraft and a representative of the supported unit who was selecting his CP location.

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During this ground reconnaissance the following were considered:

a. Condition of the ground to include firmness, availability of adequate turn-offs to permit taxiing aircraft to dispersal areas and whether or not pioneer work on the runway was required.

b. Length of runway: This varied according to Flight Groups from 800′ to 1,200′ and depended upon the individual proficiency of the least experienced aviator.

c. Cover and concealment: Sufficient natural cover and concealment were desired for each major item of equipment, supplemented if necessary with camouflage nets.

d. Dispersion: At least 50-100 yards separation between major equipment items were required at all times.

e. Access routes: Airstrips which were not easily accessible from the road could not be used effectively since aircraft cannot function without ground support.

f. Communications potential: The area must lend itself to reliable radio communications capabilities with the supported unit and Aviation Company.

g. Prevailing winds and obstacles: Was this a "one-way" strip or could aircraft utilize it in case of a wind shift? Were obstacles too high to permit safe use of the field, at night if necessary?

On several occasions during SAGE BRUSH when an airstrip could not be found within supporting distance of a proposed headquarters the commander relocated his CP in order to insure close aviation support, emphasizing the growing awareness of commanders of the necessity for Army Aviation.

When a field was determined suitable the Flight Group Commander planned wire communications, if practical, from the supported unit, indicated required pioneer work and sketched the field, marking the location of aircraft dispersal areas, vehicles, CP Tent, bivouac area, access road and the runway with indicated landing direction and turn-offs to dispersal areas.

The strip was then flagged as a potential operational base on the map while the Group commander anticipated the next move of the headquarters. The value and necessity of maintaining at least two potential strips echeloned in the direction of movement was proved throughout all phases of SAGE BRUSH. Frequently a planned CP location would be bypassed but by pre-designating proposed

airstrips at the pilot's daily briefings it was simple to determine and announce the next active airfield.

Movement

The movement of the airstrip depends upon the situation and communications available at the new area. Generally the groups operated as follows: In the retrograde (Phase III, SAGE BRUSH), the airstrip jumped to the rear in advance of the supported headquarters, basing on the rear CP or any other major unit and utilizing the grid system of wire communications to maintain contact with the headquarters. The abandoned strip was then used as a pick-up point for the forward CP until such time as it closed on the rear location. The actual move of the airstrip was made when communications were established between the airstrip and the supported unit and was accomplished by infiltration of both aircraft and vehicles, generally late in the afternoon.

Since the major headquarters usually moved at night there was always the danger of a CP moving away from the airstrip and for that reason moves had to be anticipated and conducted in advance of the supported headquarters in many cases, with a maximum utilization of pick-up strips.

During the advance (Phase V, SAGE BRUSH), the situation was not so serious. Airstrips remained in communication with the rear CP, using the new strip as a pick-up point until communications were established to the new strip at which time the Flight Group moved forward, situation permitting, usually the following morning.

Division Base Field

Criteria for selection of the Company Base Field followed the basic rules developed for the smaller strips with certain modifications. Since the base field included the "land tail" of the Company, greater consideration was given to administrative type installations and consequently a much larger dispersal area. For example, the mess, company headquarters, operations, and maintenance area are added. The maintenance area must include maintenance tents, POL dumps, and parking areas for those aircraft undergoing periodic maintenance.

Because of the immensity of this field an internal telephone line was required to all vital installations. Space for the medics, fire truck

and company supply was also included in the planning.

The mobile photo laboratory attached to the company from the Division Signal Battalion during tactical periods processed hundreds of photographs and required an immediate source of water, introducing another requirement in the selection of the base field.

The airfield was selected to permit twenty-four hour operation for all aircraft and was equipped with the field lighting kit, obstruction lights and a glide path instrument to facilitate night landings.

Because of its importance, the Company Commander personally selected and organized each of the occupied base fields, leaving his executive and operations officers in charge of the Company.

Organization

Organization of the airstrip was expedited by establishment of an SOP assigning specific duties to each individual for each move. A diagram of the field and a strip map were also furnished to key personnel prior to the move.

The rapidity of the movement, forward to rear, dictated the amount of organization and development of an airstrip. All personal gear and unnecessary tentage were packed at dawn, placing the flight group in a semi-mobile condition when a move was expected. When a displacement was fairly certain within a six hour period the units operated completely from vehicles on a 100 percent mobility basis, ready to move in thirty minutes and conducted operations on the move where necessary.

Similarly, upon moving into a new area, only required tentage for operations was erected. Individual equipment remained loaded until nightfall or until it was fairly certain that no move would be made during the night.

Actual organization of the airstrip began upon arrival of the advance party which marked the strip, indicated the landing direction, initiated required pioneer work or requested Division Engineers for assistance, and marked turn-offs to dispersal areas. Although most fields were utilized without extensive engineer preparation, a total of nine had to be improved by filling in holes, opening gaps in fences, or by marking and/or removing stumps near the runway.

Further organization of the strip by this party included marking individual aircraft dispersal areas and locating CP installations. Organization also included locating weapons positions and establish-

ing the local perimeter defense plan.

Implementation of the organization plan was accomplished as time permitted while routine aircraft operations continued. Whenever an aircraft landed at the strip the assigned crewchief met his aircraft, directed it to the dispersal area and refueled and prepared it for the next flight. Simultaneously the pilot and observer were de-briefed and briefed for their next mission.

Camouflage and Concealment

Whenever possible, aircraft were tucked into edges of tree lines bordering the field and full use made of natural cover. This was far more effective than camouflage nets alone, although nets were used extensively as supplementary concealment measures or when sufficient cover was not available. The disadvantages of using nets were the time consumed in placing and removing aircraft from camouflage and the damage incurred to aircraft from the nets, i.e., bent or broken radio antennas or other protruding parts and control surfaces.

H-13 helicopters were camouflaged primarily by covering the plexiglas bubbles with a cover prefabricated from salvaged GI blankets and by maximum use of existing shadows. Although helicopters were flown to the edge of tree lines as closely as safety permitted, it was generally not feasible to roll the helicopters under the trees on their small wheels over the rough ground since it involved too much manpower, damaged the helicopters, and required excessive time in preparing them for flight on short notice. The same generally applied to the H-19 helicopters on a larger scale. Dispersal then became the primary means of camouflage. For example, the H-19's were based at the Support Command as a separate Flight Group which permitted further dispersion of the Aviation Company.

Use of camouflage nets on H-19's was impractical because of their size and the equipment required to support the nets. Folding of blades and towing helicopters under concealment was also impractical as this precluded immediate availability of the helicopters.

Despite camouflage methods adopted, the helicopters, because of the straight edge of the main blades, were very apparent on photographs of airstrips and CP pads and drew adverse comments from commanders.

Night Flying

Missions in the flight groups were flown from dawn till dark and frequently it was well past sunset when the aircraft landed. For this reason it became necessary for each operational airstrip to have emergency night landing means. This was accomplished by utilization of #10 cans filled with sand and gasoline to mark the runway at night if required. Flight groups occupying strips which could not be used at night because of obstacles, high grass, or short runways directed their late aircraft to the base field for landing.

Night flying was best controlled from the base field equipped with its night landing kit and glide path instrument. In addition more efficient briefing and de-briefing of crew members was conducted by the G-2 Air Officer at the base field and more rapid weather and enemy air warnings were available.

One aircraft in the air at a time over the Division front was considered sufficient at night. Aircraft for the night mission were obtained by levying flight groups for pilots and aircraft on a rotational basis to distribute the night flying load equitably throughout the company.

Scheduled night flying required alternate runway lighting facilities. The base field, in addition to the night lighting kit, set out #10 cans which frequently had to be used when the kit generator failed. Extreme care was observed when using pastures or grain fields as airstrips. It was learned from experience that flare pots could very easily set an airstrip afire if the grass was too high or had not been cleared around each pot or in very gusty winds. In one actual incident, after bringing the fire under control, aircraft were retrieved by the alternate method of marking the runway with vehicle lights.

Summary

The selection and organization of army airstrips experienced by the 3d Division was a detailed process requiring continuous reconnaissance in the air, on the ground, and on the map.

Special emphasis must be placed on dispersion, not necessarily between individual aircraft but between groups of aircraft such as Flight Groups, H-19's, and the Base Field. A nuclear weapon can knock out an entire field even though aircraft are 50-100 yards apart

(Continued on page 21)

OMNI ANGLES

James Herrick

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

IN THE FLYING experience of us all there have been times when, under VFR conditions and over unfamiliar country, ground references turned out to be much less recognizable than anticipated. So indistinguishable, in fact, that we got "lost" to some extent. What can be done in those first moments of indecision to prevent them from becoming minutes, or perhaps hours, of more indecision?

Or, perhaps you have been "snookered in" suddenly short of your destination. You knew about where you were and had an approximate ETA in mind but were depending upon ground reference to get you there. What can be done then to determine an exact track and ETA?

Omni, with its 360 radials, holds the answer to both of these questions. In fact, *one* omni station will give you all of the information necessary to navigate in a straight line from one point to another. Tuned to one station, you can figure position, drift and track with extreme accuracy. Tuning a second station is necessary only as a final check and to compute ground speed. Since some 400 omni stations are located over the U. S., you are almost certain to be within receiving range of one omni station at all times. Thus in any emergency situation you can find out where you are, your angle of drift, where you are going, and when you will get there quickly and accurately with nothing more than a computer and a bit of arithmetic. Actually these same procedures can be used on any flight to determine the most direct track between two points, without routing your flight from one omni station to another. They are equally applicable under VFR or IFR conditions.

To see how it is done, let us work the following navigation problem. Bear in mind that we will use only *one* omni station from which to obtain most of our required data. You can follow

the progress of our navigation on figure 1, page 15.

Basis Data

Suppose we are flying "on top" with just an occasional hole in the clouds for visual reference and, just to start from "scratch," that we have no wind data. We simply tune our omni set to pick up the nearest station. Say our station is XYZ. (Note figure 1.) We rotate the omni course selector and see that, in this case, the deviation needle centers with a "to" reading when the big arrow hits 90 degrees. Thus station XYZ is to our right and a 90-degree inbound course would take us over it; this gives us a "line of position" fix. We do not know how far out we are, but we do have a good general knowledge of our position. From this general position, we see on the map that a 65-degree magnetic track will take us in the approximate direction of our destination. We settle down on this magnetic heading, and hold it as accurately as possible until we have acquired track and time data in reference to the omni station tuned. The map also tells us that on the 65-degree magnetic heading, we will remain to the left of the station; however, we do not know how far, nor when we will pass it.

From this "line of position" fix, begins our navigation. To our magnetic heading (65 degrees), we add 45 degrees and set 110 degrees on the course selector. Had the station been to our left, we would have subtracted 45 degrees. The omni deviation needle of course points very much to the left, with the 110-degree course setting. As we continue, it swings from left to right. When it centers we are exactly on the 110-degree inbound course to the station. We write down the *exact* time, including seconds, at which the needle centers and label this as time #1. Let us say that it is 10:05.

We add another 45 degrees to the 110-degree figure. This gives us 155 degrees, which is our wingtip "heading." We set 155 degrees on the omni course selector. The needle again deviates to the left, but swings again to the right as we continue on our 65-degree magnetic heading. When it centers, we are on the 155-degree inbound course to the station. We note the exact time and number it time #2: Let us say it is 10:11:50.

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Rather quickly after recording this second time, we move the course selector arrow an additional 10 degrees, to an inbound course of 165 degrees. When the needle centers, we record this time: 10:13:10—time #3. We hold our heading briefly, then move the course selector 35 additional degrees, in other words, a total of 45 degrees beyond the setting for time #2. This gives us the 200-degree inbound course to the station. When the needle centers, indicating that we are on this course, we again note the exact time: 10:23:40—time #4.

We now have enough basic data to determine three facts: our position, the angle of drift, and our track. So we continue for the time being on our 65-degree magnetic heading and give ourselves time to make use of the information thus far obtained.

Position

We have recorded four different time observations and numbered them, for purposes of clarity, #1, #2, #3, and #4. To find our position, we take elapsed time B, the interval between time #2 and time #3, or our time between the inbound courses of 155 degrees and 165 degrees. 10:13:10 minus 10:11:50 is 1:20, or 1 1/3 minutes. We then apply the following formula:

$$\frac{\text{minutes x speed}}{\text{degrees of bearing change}} = \text{distance from station.}$$

Since we have not computed our ground speed yet, we must use true air speed. This is not precise but will be accurate enough to give us a position fix. Thus

$$\frac{1.33 \text{ (minutes in decimals)} \times 120}{10} = 16 \text{ miles.}$$

We have thus determined quite simply, and with only one omni station, that on our 65-degree heading we were on the 165-degree inbound course 16 miles northwest of the station approximately 10½ minutes ago. This formula can be used independently in many situations to establish a fix from one omni station and to check one's track. With a known ground speed, it is very accurate.

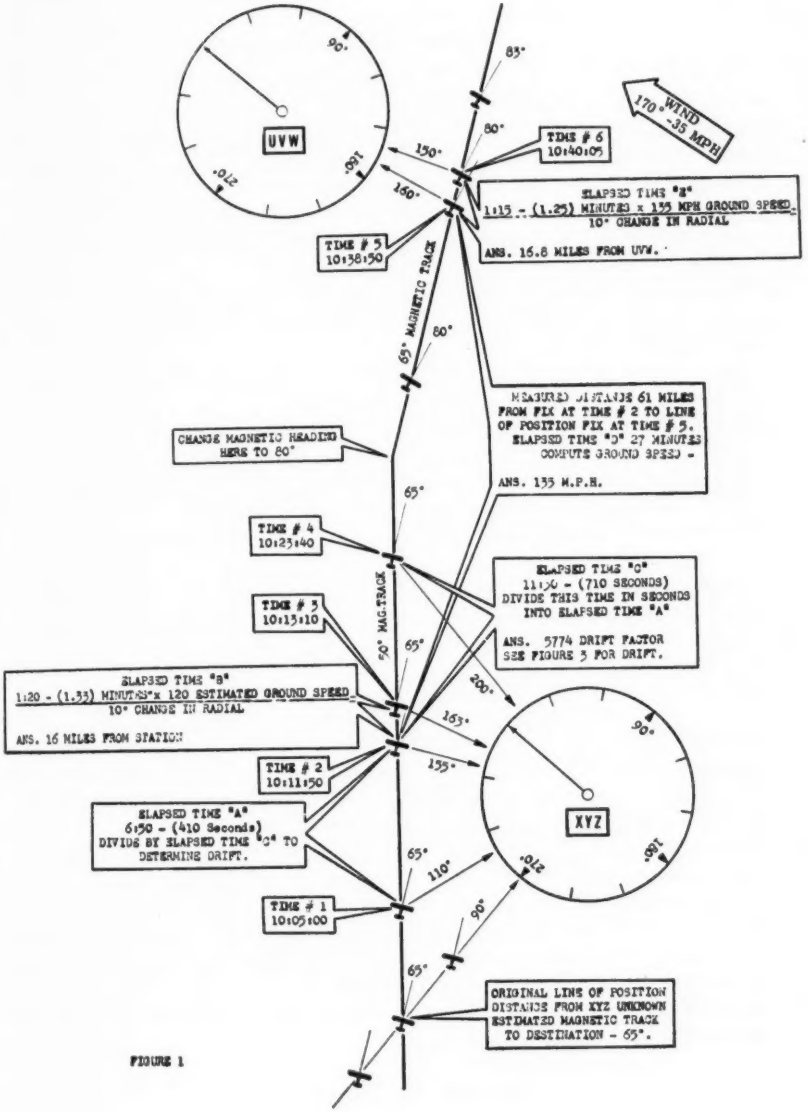
UVW
XYZ
90°
180°
270°
85°
80°
150°
160°
WIND 170° -35 MPH
TIME # 6 10:40:05
TIME # 5 10:38:50
ELAPSED TIME "E" 1:15 - (1.25) MINUTES x 135 MPH GROUND SPEED 10° CHANGE IN RADIAL
ANS. 16.8 MILES FROM UVW.
65° MAGNETIC TRACK
80°
MEASURED DISTANCE 61 MILES FROM FIX AT TIME # 2 TO LINE OF POSITION FIX AT TIME # 5. ELAPSED TIME "D" 27 MINUTES COMPUTE GROUND SPEED -
ANS. 133 M.P.H.
CHANGE MAGNETIC HEADING HERE TO 80°
65°
TIME # 4 10:23:40
ELAPSED TIME "C" 11:50 - (710 SECONDS) DIVIDE THIS TIME IN SECONDS INTO ELAPSED TIME "A"
ANS. 5774 DRIFT FACTOR SEE FIGURE 3 FOR DRIFT.
TIME # 3 10:15:10
50° MAG. TRACK
65°
ELAPSED TIME "B" 1:20 - (1.33) MINUTES x 120 ESTIMATED GROUND SPEED 10° CHANGE IN RADIAL
ANS. 16 MILES FROM STATION
200°
163°
155°
TIME # 2 10:11:50
ELAPSED TIME "A" 6:50 - (410 Seconds) DIVIDE BY ELAPSED TIME "C" TO DETERMING DRIFT.
65°
110°
TIME # 1 10:05:00
90°
65°
ORIGINAL LINE OF POSITION DISTANCE FROM XYZ UNKNOWN ESTIMATED MAGNETIC TRACK TO DESTINATION - 65°.

FIGURE 1

TO FIND—POSITION, TRACK, DRIFT, GROUND SPEED—WIND DIRECTION AND VELOCITY—ALL BY "OMNI"

Note Figure 1

1. Establish at least "Line of Position" fix from one Omni station. Use second Omni station if available, to establish a "fix." Proceed toward destination. Allow for wind if even a wind "guess" is available.
2. From above choose a "Magnetic Heading" and hold it accurately. In time "Heading" will take you near an Omni as for example in Figure 1 at XYZ.
3. Well before passing Omni determine omni radial at 45° angle to "Magnetic Heading" (110° in Figure 1). Set Omni Selector and note time at crossing this radial.
4. Reset Omni Selector to radial at 90° to "Magnetic Heading" (155° in Figure 1). Note time at crossing this radial.
5. Reset Omni Selector to radial 10° "beyond" radial in item 4 above. (165° in Figure 1). Note time at crossing this radial.
6. Move Omni Selector additional 35° or total of 45° from radial in #4 (200° in Figure 1). Note time at crossing this radial.
7. Determine "Elapsed Time" between times recorded between—
   #3 and #4—Elapsed Time "A" ..... in Seconds
   and between #4 and #5 Elapsed Time "B" ..... in Minutes
   and between #4 and #6 Elapsed Time "C" ..... in Seconds
8. $\frac{\text{Elapsed Time "B" x Ground Speed (or True Air Speed if G.S. unknown)}}{\text{10° Change in Radial}}$ = Distance from Station in Miles
9. $\frac{\text{Elapsed Time "A"}}{\text{Elapsed Time "C"}}$ = Drift Factor—See Drift Factor Chart Figure 3 for Drift
10. Distance from station in #8 provides "Fix" and with "Drift" and "Magnetic Heading" known, "Track" can be determined.
11. When passing a Second Omni station another "line of position fix" can be done by setting Omni Selector at 90° to "Magnetic Tract." Ground speed can thus be determined.
12. With Ground Speed known and "Track" and "Drift" known from earlier computations a computer can be used to "back up" the problem and determine "Wind Direction and Velocity."
13. With Wind Direction and Velocity known any course can be flown with accuracy.

CHART NUMBER 1

DRIFT BY TIMING

I Select Magnetic Heading and hold accurately.

II Tune omni station, off course and ahead, not more than 45° right or left of Magnetic Heading.

III Observe Times at crossing of 3 radials—Magnetic Heading plus for station on right (minus for station on left) or minus each of the following.

$$\frac{\text{1st Elapsed Time in Seconds}}{\text{2nd Elapsed Time in Seconds}} = \text{Drift Factor}$$

Drift Toward Station	Drift Degrees	Drift Away From Station
1.0355	1	.9657
1.0724	2	.9325
1.1106	3	.9004
1.1504	4	.8693
1.1918	5	.8391
1.2349	6	.8098
1.2799	7	.7813
1.3270	8	.7536
1.3764	9	.7265
1.4281	10	.7002
1.4826	11	.6745
1.5399	12	.6494
1.6003	13	.6249
1.6643	14	.6009
1.7321	15	.5774
1.8040	16	.5543
1.8807	17	.5317
1.9626	18	.5095
2.0503	19	.4877
2.1445	20	.4663
2.2560	21	.4452
2.3559	22	.4245
2.4751	23	.4040
2.6051	24	.3839
2.7475	25	.3640
2.9042	26	.3443
3.0777	27	.3249
3.2709	28	.3057
3.4874	29	.2868
3.7321	30	.2680
4.0108	31	.2493
4.3315	32	.2309
4.7046	33	.2126
5.1446	34	.1944
5.6713	35	.1763
6.3138	36	.1584
7.1154	37	.1405
8.1443	38	.1228
9.5144	39	.1051
11.430	40	.0875

CHART NUMBER 2

Drift

We now know our location but, since we still do not know the angle of drift, we cannot yet say that we know *exactly* where we are going. So let us see how we can determine the drift and, thus, our track. Time readings #1 and #2 give us an elapsed time A of 410 seconds. Readings #2 and #4 give us an elapsed time C of 710 seconds. Elapsed time A divided by elapsed time C will give us the drift factor. Note table on page 17. In this case, our answer comes out .5774. This problem can be worked by hand or on a slide rule or any navigation computer. In using any computer, find elapsed time A on the outer scale and line up with it elapsed time C on the inner scale. The correct drift factor then appears on the outer scale opposite "10" on the inner scale. For those readers who are technically inclined, the drift factor is either the tangent or the cotangent of the angles involved. But all we really need to know is that, on the accompanying drift factor chart (chart 2), this figure appears opposite our angle of drift. For example, our drift factor of .5774 is in the "drift away from station" column opposite 15 degrees. Therefore, we have a 15-degree drift to the left.

Track

Now what is our track? We know drift and the magnetic heading we have been holding. We also know that we passed about 16 miles to the left of omni station XYZ. From this 16-mile-out point on a 65-degree magnetic heading, we see that we will reach our destination quite accurately. But to maintain this 65-degree track, we must correct for drift. Therefore, our angle of drift (15 degrees) added to the magnetic heading gives us a new heading of 80 degrees. Had drift been to the right, we would have subtracted the angle of drift to arrive at the new heading. So we take up this new heading of 80 degrees.

Ground Speed

But we can relax for a few minutes, hold our 80-degree heading, and await an opportunity to get another "fix." To the left of our track and ahead of us is another omni station, say UVW. We could change our course and fly over this station, but why go out of our way unnecessarily? Besides, to leave our 80-degree heading would

"foul up" some of our navigation thus far. We would be better off to continue directly on our general course to destination.

As we get near the station, we tune it in and rotate the course selector until the large arrow points to a reading 90 degrees to the left or right of our 65-degree magnetic track. It makes no difference which we choose, but it will make a difference in the "to-from" indicator reading. Say we choose a course to the right, adding 90 degrees to our 65-degree magnetic heading. We come out with 155 degrees, but to get a round number which is easier to read both on the dial and on the map, we set 160 degrees on the course selector. The needle swings, this time to the far right. As it swings back to the left, we record the exact time at which it centers, indicating our position on the 160-degree radial. Incidentally our "to-from" indicator reads from. Thus we have 10:38:50—time #5.

With this new "line of position" we can determine ground speed quite accurately and are really in business for complete navigation. Admittedly we dog-legged some 15 degrees between the two omni stations, but our ground speed will be quite accurate even so. With the mile scale along the edge of our map, we measure the distance from time #2 to time #5 and find that it is 61 miles. Thus we have travelled 61 miles in 27 minutes, elapsed time D or 10:38:50 minus 10:11:50. This worked by hand or on any simple computer gives us 135 mph ground speed.

While we are at it, let us take one more time check at the next 10-degree radial from station UVW and thus work another distance-from-station problem just to see how well we are holding our new track. We set 150 degrees on the course selector, and the time at which the needle again centers is 10:40:05. This is time #6. Elapsed time E is therefore 1:15, or 1¼ minutes. With the same formula as we used before, this gives us 1.25 (elapsed time in decimals) multiplied by 135 (ground speed as just computed) then divided by 10 (degrees bearing change), or 16.8 miles. We can now see that we are slightly to the left of track since our intended track lies some 18 miles from omni station UVW.

All Tools Available

We now have the last of our "tools" for any kind of navigation problem which we may desire to solve. All we have to do with the information we now have is to make full use of it with any reason-

ably complete computer. We merely "back up" the problem and reverse the procedure which we are taught in navigation books. Instead of starting with wind direction and velocity, we take the other factors and enter the problem through the back door, so to speak. All we do now is read the instructions with the particular computer we have, and start the wheel turning. In this instance, our computer gives us a wind direction of 170 degrees and a velocity of 35 mph. Now that we have computed wind and feel that it is accurate, we might call UVW radio and tell them what we have found since they may not have such an accurate reading at our altitude.

With our new-found wind information, along with our "fix" in miles out from station UVW, we can now recompute a heading which will keep us on the desired 65-degree magnetic track. Putting the winds data into our computer, we find that our turning a bit more toward the wind affected us in two ways: It slowed us down a bit, from 135 mph ground speed to about 125 mph, and we now have a crosswind which is a bit more direct, increasing our drift to 17 degrees. Combining this information with the fact that flying the 15-degree drift correction threw us about 1.2 miles to the left of our intended track as we passed station UVW, we find from the computer that we should turn 3 degrees more to the right to a heading of 83 degrees. This new heading should be quite accurate and no major changes in heading should be required to destination; however, if we were on a long cross country, confirming it as we approach another omni station would not be amiss. Actually, the "line of position" fix procedure can be repeated as many times as desired during a flight, to navigate a desired track rather than flying directly from one omni station to another. Each time it is repeated, precision is improved.

ETA

We now have our ground speed and are holding a heading which, under present wind conditions, will keep us on our desired track and can therefore arrive at an accurate ETA. Further, with *complete* wind information now at our finger tips, we can compute heading, drift, ground speed, and ETA for any track we might want to take to an alternate destination.

All of this information we got with only the second-hand on our watch and two omni stations. Further, all but a small part of the information was obtained from *one* omni station; and we could

have computed even ground speed very accurately without using the second station had we had the time of an earlier fix. One word of caution: Ground speeds are not good unless fixes are accurate, so be precise. Remember that it is not "precise" to record time while passing directly over an omni station. Because the width of radial is so much smaller here than further out, the needle apparently becomes more sensitive and swings back and forth somewhat spasmodically. Thus it is impossible to tell exactly when you are directly over the station. Passing slightly to one side and setting up an omni course at 90 degrees to your track is much more accurate and will result in accurate calculations.

Principles of the foregoing omni problem are particularly practical in their application to actual navigation situations because they give you an accurate, systematic method of collecting navigation data while you are at the same time proceeding toward your destination. It took us only 35:05 to collect all the data, and we had most of what we needed in 20 minutes yet were still that much nearer our destination and on a quite accurate course to it.

There are scores of ways to use one or more omni stations as aids to navigation. Actually, it would be hard to remain "lost" very long if you really know omni and how to use it. There is only one problem explained here, but the application of omni in actual flight situations is unlimited. It is all a matter of improving your ability to tune yourself to omni. The facilities are at work 24 hours a day with lots of help; you need only to listen and apply the information available.

(SELECTION AND ORGANIZATION OF ARMY AIRSTRIPS

continued from page 11)

but, if the Aviation Company is dispersed onto several fields, support to the division will not cease because of the loss of one field.

The basic concepts of operation contained in FM 20-100 Army Aviation are applicable under normal terrain conditions and the techniques of reconnaissance, selection, occupation, organization, and development of army airstrips as developed therein are sound. However, as in any Field Manual which is used primarily as a guide, the doctrines and techniques are considered to be flexible and must be adapted to the situation, the weather, the terrain, and to the experience of the individuals.

BOOKS

For The Army Aviator

200 MILES UP, *Second Edition—Vaeth, J. Gordon (The Ronald Press Company, 15 East 26th St., New York 10, N. Y., 1955. $5.00)*

This is the story of the highest flights yet achieved, or about to be achieved, by man-made objects. Its characters are powerful rockets, high soaring balloons, and man-made satellites; its theme scientific research; its setting the frontiers of space; and its time the present and the future.

Written in simple factual terms and illustrated with scores of photographs and drawings, "200 Miles Up" is packed with exciting information about the progress of the American program of upper air research since its inception in 1946. The book gives a detailed description of the balloons and rockets, their instrumentation and operation. The performance of the vehicles and the scientific findings their use has made possible are evaluated.

Here, too, is a progress report on man's coming mastery of space. The author discusses the artificial satellite, its design and instrumentation, its launching and probable orbit, and its importance to atmospheric and extra-terrestrial knowledge. Finally, Mr. Vaeth draws on the sum of today's experience to make a realistic forecast of the beginnings of tomorrow's space travel.

AIRBORNE WARFARE—*Gavin, Lieutenant General James M. (The Infantry Journal Press, 1115 Seventeenth St., N.W., Washington 6, D. C., 1947. $3.00)*

"The future of our armed forces is in the air. All fighting men and everything they need to fight with in the future and live on as they fight must be capable of movement by air. Only through flight can we wage a future war in accordance with the principles of surprise, mass, and economy of means. Only by exploiting to the utmost the great potential of flight can we combine complete dispersion in the defense with the facility of rapidly massing for counterattack which today's and tomorrow's Army must possess. Even without the

power and use of atomic energy for war these things would be true. With the use of atomic energy they become axiomatic."

The writer of these words is a foremost U. S. Army expert on airborne warfare. General Gavin tells what has happened in airborne warfare. But more important, he offers his opinions, based on experience and research, on what will happen in the future. The book covers every Allied airborne campaign in World War II, but the discussion is not purely past history but rather an estimate of future developments.

Up to and including World War I, men walked to battle. In World War II, men still walked, but large numbers rode in vehicles, and smaller numbers flew. If there is a World War III, the bulk of the armies will fly to battle; their supplies will be flown to them also. With the rapid movement this form of transport makes vital and necessary, tactical and strategical situations will inevitably change from hour to hour, instead of from week to week. From the high command down to the last rifle-toting infantryman, the quickened speed of war will bring new problems and new methods of dealing with old problems.

The next war, if it should ever come, will come to all of us. No longer will we be insulated by lines of men at some distant front. The "front" will change to innumerable "fronts"—and those may be anywhere on the surface of the earth. General Gavin tells how it will be fought.

THE AIRCRAFT OF THE WORLD—*Green, William and Pollinger, Gerald (Hanover House, 575 Madison Ave., New York, N. Y., 1956. $7.95)*

"The Aircraft of the World" is probably the most comprehensive and authoritative aircraft reference manual of its kind ever produced. Prior to 1954, when the first edition was published, there was no book embracing the vast number of aircraft types to be seen throughout the world; no serious attempt had been made to describe in one volume *all* aircraft types flying, regardless of their age or

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Book reviews are compiled by the ARMY AVIATION DIGEST *staff. The views expressed are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor*

importance.

The new, 1956 edition of "The Aircraft of the World" is not only revised, it is virtually a new book and a new source of reference. Enlarged and containing specifications and details of nearly one thousand aircraft (including seventy-two rotary-wing aircraft), it provides a wealth of information on all aircraft known to be flying today. The reader will find the latest and most radical combat aircraft types, such as the Chance Vought Crusader and Martin Sea-Master; new commercial machines, such as the Fokker Friendship and Handley Page Herald; and research machines dictating future trends in aircraft design, such as the Fairey F.D.2 and Bell X-2. He will discover a fascinating variety of elderly airplanes which, spanning decades of aviation progress, still perform useful functions, such as the Polikarpov 1-15 and 1-16 fighters, relics of the Spanish Civil War. These and a host of others can be found only in this comprehensive reference book of world wings which is illustrated with almost 1,200 photographs and three-view silhouettes.

THE NEW WARFARE—*Barclay, Brigadier C. N., C.B.E., D.S.O. (The Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y., ... $2.75)*

Since the end of the Second World War, conditions previously unknown in international relations have been experienced. The world has been divided by the two ideologies of Western democracy and Eastern communism, divided not by the organization of normal diplomacy, but by hostile actions and constant provocations which in any other period would have led to war, yet the world is still nominally at peace.

In "The New Warfare" Brigadier C. N. Barclay, known to many as Editor of "The Army Quarterly," discusses and develops the theme that the existing conditions in world affairs amount to war, *the new warfare*, not a full-scale shooting contest, but the modern substitute of propaganda, underground activities, armed threats and limited war by proxy. The author expresses the view that this state of affairs will continue for many years and that the death of Stalin has resulted in no change either of heart or policy, only a change of method in Russia. The possibilities of resolving this difficult problem over a period of years are discussed in detail.

THE FIRST FIVE MILLION MILES—*Moore, Byron (Harper & Brothers, 49 East 33rd St., New York 16, N. Y., 1955. $3.75)*

"... when you come to the fork in the road, get over on the left side to miss that silo; after you cross the railroad tracks, pull up into the soup, count to thirty, then let down—that way you'll miss the high-tension line; when the highway angles left, take the fourth dirt road and follow it to the ravine—just across the ravine is the airport."

That was how pilot Byron Moore and his colleagues navigated homeward in the days of aviation's infancy, where this book begins.

Here, for the first time, is the fascinating inside-out story of America's airlines industry. Byron Moore has traced the evolution of commercial aviation from the days when goggled and helmeted pilots hedge-hopped across the continent in unreliable open-cockpit airplanes to present-day stratosphere flight with cocktail hours aloft and radio-controlled navigation.

Few outside the profession know of the colorful personalities, the genius and heroics over the years that have made modern air efficiency what it is: the early mail routes through all weathers; the test pilots who refused to take a factory's word; men like American Airlines President C. R. Smith who fashioned a shaky experiment into a thriving business; and, perhaps most important of all, the faithful pioneer passengers who more often than not arrived dishevelled and hours off schedule only to take to the air again at the next opportunity.

And this is a lively report of what goes on behind the scenes today; the intricate systems of communication (by radio, radar, and telephone); what happens when you want to make a reservation; what the airlines do about the weather; the epic scale on which maintenance is organized (overhauling, inspection, and rotation of equipment); how a pilot is trained; what makes a good stewardess; and what is likely to come next in the way of plane models, speeds and comforts—almost anything, the author intimates, in this most fantastic of industries where today's innovations are already obsolete.

Byron Moore's own career, as barn-stormer, mail pilot, test pilot, Air Transport Command pilot during the war, and now, senior pilot for American Airlines, is in a sense the story of American aviation. And through his lively account of experiences and encounters with planes and personalities along the way, the reader shares with him the amazing thirty-year history of air transport.

UER HIGHLIGHTS

Major James R. Hodge, *Transportation Corps*

The views expressed in this article are the author's and are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor

IN ARMY AVIATION circles, you often hear discussions on aircraft spare parts, especially on the lack of them. The problem is actually not a lack of parts, but one of having the right part at the right place at the right time. We know of an instance where an organization had a room full of L-19 rear seats, but no spare carburetors. That might be all right for Class 1 supplies. If the menu called for hot cakes and you had nothing but eggs, you could probably serve eggs. But, you cannot replace a carburetor with the rear seat of an L-19.

If you expect a simple solution to this problem, please turn to another article, as none will be offered in this column. The selection of spare parts for today's aircraft consists of highly complicated engineering evaluation, and maintenance planning, as well as some guess-work. But it helps, in the field, to know what is going on.

The system, by which spare parts are selected and put in channels, used by the Transportation Corps Supply and Maintenance Command is called "source coding." This may appear, on the surface, to be a complicated "gyration" designed to "compound the confusion," but let us take a look at it.

It is quite obvious that to maintain a supply of each part which goes into the manufacturing of each airplane would be impossible. The job is huge. For example, of the 7,609 line items which go into the H-13, 2,000 were finally selected for initial procurement; a few others may be added if required.

To accomplish this, each blue print and major part was examined in disassembly breakdown sequence. At this time, the source of each part was determined and recorded.

In selecting parts for our "spare parts" warehouse, if it is

determined that loss of the part in question would probably result in salvage of the aircraft, the part is coded "X." If it is determined that a higher assembly will be furnished, the part is coded "X_1."

If it is more practical to manufacture the part than to stock it, it is coded M or M_1. The M code designates a part to be manufactured in the field, while M_1 parts will require depot equipment. M_1 parts usually require heat treatment, plating, or testing which cannot be accomplished by field maintenance shops.

Many assemblies are never procured. It may be more practical to provide individual parts. In this case, the assembly is coded A or A_1; similar to M or M_1 above. Only in rare cases, such as aircraft engines, do we find it necessary to provide both the assembly and all the details. Where this occurs, care must be taken that entire assemblies are not used, in lieu of replacing a few parts, thereby causing excessive expense.

What about the parts we want to stock? This is where the supply support hinges. It is obvious that the prime contractor can manufacture his parts better and cheaper than the military. It is also obvious that, in an emergency, we could manufacture some items for ourselves.

We break down, by anticipated requirement, items which we cannot make in our service shops. The code X_2 is applied to such parts for which there is no anticipated requirement. These parts might be obtained by cannibalization of wrecks, but most probably they will be bought on a special purchase basis, if they should be required. If it is determined, through experience, that an X_2 part, although seldom used, should be kept in stock as an insurance type item, it may be classified as a P_2 part. Structural sub-assemblies fall into this category. These are the slowest moving items. If it is a part which cannot be made by a service unit but which is required frequently as a spare, it is classified P_1 and stocked so as to be available for immediate use.

If it is a part which can be made by our service units and is used frequently, it is coded M or M_1 (as above), or P and procured

(Continued on page 35)

The UER Highlights Department, *prepared by Major James R. Hodge, is compiled from information contained in Unsatisfactory Equipment Reports received by the Transportation Corps Supply and Maintenance Command, 12th and Spruce Streets, St. Louis 2, Mo. Major Hodge is Chief of TSMC's Aircraft Maintenance Engineering Division.—The Editor*

The Gray Hair Department

ALTHOUGH TAXIING an aircraft is an elementary maneuver, there are numerous taxi accidents. Following are examples of some of our more recent ones which cost the Army $12,485.57. The "narrative description" sections of the accident report have been summarized. The primary unsafe act, contributing factors, and comments of the Army Aviation Safety Board are direct quotes from the reports.

Major Arington C. Thompson, Jr., *above, is a graduate of both the Basic and Advanced Officer Course, The Artillery School. He is Executive Officer of the 337th Field Artillery Battalion at Fort Rucker, Alabama. Prior to WWII, he attended the University of Missouri. During WWII he served in Europe with the 76th FA Bn and later as assistant artillery aviation officer with the 2d Army. Between WWII and the Korean War he served as division artillery adjutant with the 25th Division in Japan, as assistant S-3 with the 2d Armored Division at Fort Hood and as assistant secretary, headquarters the Artillery School. During the Korean War he served as assistant X Corps artillery aviation officer and later as aviation officer of UNCMAC. Upon his return to the States he served as secretary of The Army Aviation School until receiving his present assignment in 1955. He is instrument rated and qualified in both rotary- and fixed-wing aircraft.—The Editor*

L-19

After landing at an Air Force Base, the pilot turned his L-19 off the runway and called the tower for taxi instructions to the tie down area. He was told to wait for a "follow-me" truck which would guide him to the transient parking ramp. The pilot waited over five minutes for the truck, then called the tower again. He was informed to taxi down a parking ramp until the tower personnel had him in sight. Following these instructions, the pilot made a right turn and taxied up the ramp behind parked KC-97 type aircraft. An engine run-up was being made on one of the KC-97's. As the L-19 passed behind it, the propwash spun it around 100 degrees, scraping the right wing, aileron, and hub of the right wheel on the ramp.

The primary cause was "Pilot taxiing behind and too close to a large four engine aircraft (KC-97) which was in the process of an engine runup."

Contributing factors: "The tower operator cleared the pilot to taxi up the taxiway, however, he was not aware that the engines of the KC-97 were running."

The Army Aviation Safety Board concurred with the findings of the Army Aviation Accident Investigation Board.

L-19

A pilot was attempting to park his L-19 in the aircraft's designated tie-down spot. The pilot said, "I stopped the aircraft in a position to turn right and place the main landing gear on the painted parking spaces. The wind was calm and with the control stick held in the rear position, I released the left brake, holding right rudder and right brake, but the aircraft did not turn. I increased power, and when the aircraft still did not turn I applied forward pressure on the

control stick in an effort to take some of the weight off the tail wheel. This caused the tail to rise, the propeller to lower and strike the asphalt ramp. This in turn caused the propeller to be bent and nicked."

Primary unsafe act: " . . .improper ground handling of aircraft, because the pilot attempted to taxi the aircraft into a confined area, rather than to have ground personnel park it manually."

The Army Aviation Safety Board did not concur with the findings of the investigation board. The Safety Board stated, "Information contained in the report of accident established that this accident was caused by improper use of elevator flight controls, because the tail of the aircraft was permitted to rise while the aircraft was being taxied, resulting in the propeller striking the ground."

H-19D

An H-19D pilot, after completing a flight, taxied into the POL area for refueling. He stopped adjacent to an elevated gasoline

tank and his main rotor blade overlapped the top of the tank. When the throttle was reduced the blades "drooped" and struck the tank. The tank was situated on top of a platform approximately 14 feet high.

Primary unsafe act: "The pilot taxied too close to an elevated gasoline storage tank."

Contributing factors: "Non-compliance with Unit SOP in that the pilot did not have a crew chief on the ground to guide the helicopter into the parking space." (Also this is in violation of regulations SR 95-85-5, para 5b which states "When an aircraft is maneuvered in close proximity to buildings, or other obstructions, a member of the ground crew will be positioned to insure adequate guidance.")

The Army Aviation Safety Board concurred in the findings recorded on the accident report.

L-19

A pilot made a wheel landing, for practice, in an L-19 on a 3,000-foot sod and gravel strip. As he rolled along tail high, he decided to continue, in a tail high attitude, to the taxi strip 1,800 feet down the runway. However, upon reaching the strip, he did not lower the tail but started a turn using brakes to help turn the aircraft. The gear spread and his propeller hit the runway, breaking off approximately ½ inch of the tips.

Primary unsafe act: "Pilot error in that the pilot attempted a tail high fast taxi which was beyond his capabilities."

Unsafe physical condition was, "Right main landing gear leaf was found to be loose, allowing the propeller to strike the ground when the aircraft was in an extreme nose low attitude."

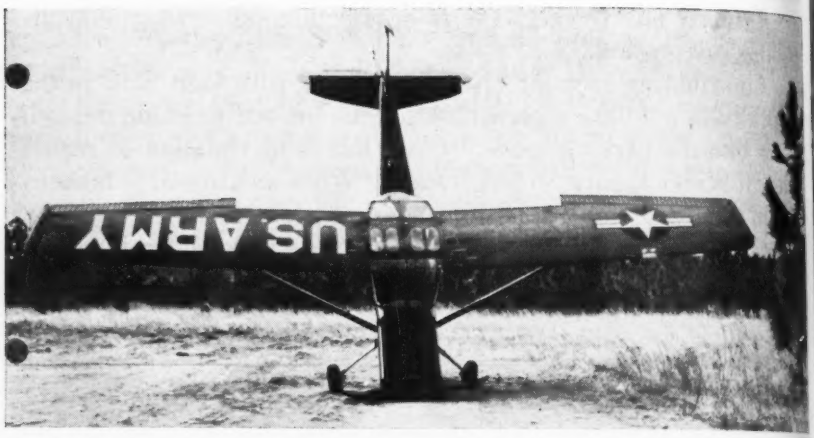
Contributing factors: "Excessive braking of aircraft in a tail high attitude. Attempting a ninety-degree turn while in a tail high attitude."

The Army Aviation Safety Board concurred with the above findings.

L-19

The pilot had been practicing landings in an L-19 on a local "road strip." After his second landing he taxied back to takeoff position and swung the aircraft around in a clearing 360-degree turn for takeoff. As the aircraft turned into position, the pilot saw

a tree on his left which appeared to be in the path of his left wing. He immediately applied brakes and nose into the ground. His wing tip would have missed the tree by 18 inches.



Primary unsafe act: "Excessive use of brakes."

Contributing factors: "Turning the aircraft at an excessive speed plus the lone pine tree which was located 9 feet from the edge of the runway."

The Army Aviation Safety Board concurred in these findings.

H-19C

Operating from a parking lot during a flood disaster operation in the winter of 1955, an H-19C pilot was taxiing his aircraft to the parking area. In doing so it was necessary to turn off the taxi strip 90 degrees and taxi between other parked H-21 helicopters and a passenger loading platform. The distance between the loading dock and parked H-21's was approximately 87 feet. Because of the shortage of personnel, the crew chiefs were used to load and unload supplies, and were not available for directing ground movement of aircraft. There was, however, a stripe painted down the center of the narrow taxi area to guide pilots in taxiing, but the pilot of the H-19 moved to the right of this line because several of the parked H-21's were being run up. He misjudged the distance from his main rotor to a concrete light pole on his right side. The tips of the rotor blades struck the pole.

Primary unsafe act: "Taxiing the helicopter in a congested area without the aid of ground crew personnel to guide the pilot during taxi movement as is required by Par. 5*b*., SR 95-85-5, 23 Jan 50."

Contributing factors: "A shortage of personnel to guide helicopters. Only one mechanic was assigned per helicopter and when these mechanics were not engaged in aircraft maintenance, they were utilized as stevedores at the aircraft-truck transfer point."

Comments of the Army Aviation Safety Board: "This board concurs with the analysis of the accident by the Aircraft Accident Investigation Board as stated above, and considers supervisory error to be a contributing factor in that insufficient ground crew personnel were assigned to assure that safe ground handling techniques were employed."

L-19

During a recent maneuver, a pilot landed his L-19 on a civilian field that was being used as a base for a TAAM Company. He taxied off the runway and turned toward the parking ramp. As he turned a soldier, who had been sitting in the grass just off the apron, stood

up. Assuming that he would direct the aircraft, the pilot taxied toward him. However, as the pilot neared the soldier, he walked away. Then, not seeing any other personnel on or near the ramp, the pilot continued to taxi but as he turned toward the parking line, his right wing struck a small building, damaging the wingtip and popping out the cabin top plexiglas windows.

Primary unsafe act: "Taxiing too close to an obstruction."

Contributing factors: "(a) No personnel on hand to park aircraft. (b) Taxiing into the sun."

The Army Aviation Safety Board concurred in the above findings.

L-19

An assistant crew chief was taxiing an L-19 aircraft to the tie down area. Snow had fallen the night before, covering the ground with a thin layer. The crew chief made a wide 180-degree turn from the taxi strip into the parking area, taxied to his parking spot and started a 90-degree turn to park. The tires slipped and the aircraft slid on a 45-degree angle toward the L-19 tied down on the adjacent spot. The mechanic was taxiing without a parachute and being comparatively small in stature, 5 feet 5 inches tall, could not move the rudder pedals to their full limits. In order to apply more pressure to the brakes he grabbed the vertex bars with both hands, thus leaving the throttle open and the engine turning at a comparatively high rpm. The propeller hit the left wing of the tied down aircraft, the mechanic let go of everything and jumped out of the aircraft after it stopped. Another crew chief ran to the accident, cut the switches, and pulled the battery cables off.

Primary unsafe act: "Improper control of aircraft due to the relatively short height of the individual while taxiing without a parachute in the front seat resulted in his inability to reach brake controls without releasing the throttle."

Contributing factors: "Frozen snow and improper taxiing techniques by the mechanic."

Comments of the Army Aviation Safety Board: "This board does not concur with the findings of the Aircraft Accident Investigation Board as stated above. This accident was the result of failure on the part of the mechanic to retard the engine to idle when attempting to stop the aircraft by braking action on a snow covered surface."

***The Gray Hair Department** is prepared by the* ARMY AVIATION DIGEST *staff with information obtained from the files of the Army Aviation Safety Board. The views expressed in this department are not necessarily those of the Department of the Army or of The Army Aviation School.—The Editor*

(UER HIGHLIGHTS *continued from page 27)*

Many parts, previously procured, are marked with an asterisk. This is usually the result of a design change or selection of a better item. In this case, the TC 7 & 8 must be consulted to determine the new part and if the old part is usable. The asterisk is also applied to wiring diagrams, installation drawings, and information prints to assure that they are not considered as parts.

Finally, there are the vendor codes, V and V_1, which denote items procured from vendors rather than prime manufacturers. They mean the same to vendor items that P and P_1 do to prime items.

So what. What does all that verbage mean to us? Well, frankly nothing right now, but . . .

Future parts catalog technical orders will contain source codes. These codes will be listed in the index and, where required, will be broken down between Army, Navy, and Air Force. Use of these codes before requisitioning, will save weeks of delay and its attendant frustration, not to mention long periods of AOCP. This information, together with the TC 7 or 8 catalog, should assist in your operations.

Last but not least, and this probably sounds like a broken record, Unsatisfactory Reports! If, in your opinion, the "source code" is wrong, submit a UER. Remember, most codes were applied during initial provisioning, often before the part was manufactured.

Straight and Level

HEADQUARTERS
UNITED STATES ARMY FORCES,
FAR EAST AND EIGHTH UNITED
STATES ARMY

SUBJECT: *Use of Army Helicopters in "Operation Saint Bernard"*

TO: *Commandant*
Army Aviation School

1. This letter report of utilization of Army aircraft in support of isolated ROK troops is forwarded as a matter of possible interest to the Aviation School. During the last week of February, 1956, unusually heavy snowfall occurred in eastern area of the main battle position in Korea. The area affected extended east from the historic "Punch Bowl," and was occupied by ROK troops. Snowbanks six to eight feet deep immobilized the Korean troops and disaster threatened because of lack of communication, transportation, reserves of food, fuel, and clothing.

2. Army helicopters were made available to augment ROK resources in an operation appropriately named "Operation Saint Bernard." The 13th Transportation Company (Hcptr), 1st Medical Helicopter Company (Prov), 24th Infantry Division, 7th Infantry Division, KMAG, and AFFE/8A Flight Detachment were alerted to participate in the operation. Initially, two (2) H-19's of the 13th Transportation Company and four (4) H-13's of KMAG were utilized for reconnaissance and resupply. After a reconnaissance by the AFFE/8A Transportation Officer and the Aviation Officer, additional helicopters were dispatched from the 13th Transportation Company (3), 24th Infantry Division (2), the 1st Medical Helicopter Company (2), the 7th Infantry Division (1), and the 3d Light Aviation Section (1). Operations were based at A-6, 23 miles northeast of CHUNCHON, Korea (CS 8893).

3. Resupply missions were allocated by the KMAG G-4 advisor in coordination with the ROK Corps G-4. Resupply flights were then scheduled by the air traffic coordinator with the flight operations officer. Resupply missions were accomplished in H-13's or H-19's, whichever were most appropriate. Evacuation missions were reported directly to the flight operations officer for accomplishment. In many cases where an H-19 was dispatched on a resupply mission, an H-13 accompanied it to reconnoiter the specific drop site. Supplies had to be dropped practically in the hands of troops because of the deep snow. Use of H-13's for reconnaissance saved many flying hours on the H-19's.

4. Air traffic was controlled at A-6 using an L-19 airplane radio. All aviators monitored 122.5 mc continuously during operations. Special priority was given for maintenance and supply of the aircraft participating. During the first two days of the operation, helicopter fuel was flown into A-6 by helicopter because roads were not open and weather did not permit use of fixed-wing aircraft. Only 1st echelon maintenance was performed at A-6, with aircraft being replaced by the parent organization when higher echelon maintenance was required.

5. During the operation, 28 February to 8 March, helicopters moved 66,070 pounds of supplies and evacuated 28 persons from otherwise inaccessible points. The helicopters were operated in snow storms and in mild to heavy turbulence, with temperatures varying from 20°F to 35°F, and altitudes from 500 feet to 4,500 feet. A total of 34 aviators and 25 ground crew personnel participated directly in the operation. Despite the unfavorable weather conditions, the operation was completed without an aircraft accident.

6. Letters of appreciation were sent by General White to the individuals who participated in the operation. The Republic of Korea Army presented seven individual decorations, ten individual letters of appreciation, and two unit citations.

FOR THE COMMANDER:

GEORGE A. FARMER
Captain, AGC
Asst AG